

# P Curcuma longa

## Common Name(s)

Indian Saffron, Turmeric

## How Used

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| Chemical Plant Part   | Low PPM                   | High PPM | StdDev | Reference | Citation |
|---|---------------------------|----------|--------|-----------|----------|
| 0 (+)-(S)-AR-TURMERONE  | Rhizome                   | --       | --     |           |          |
| 0 (+)-ALPHA-PHELLANDRENE  | Root<br>Essent.<br>Oil    | --       | --     |           |          |
| 0 (+)-ALPHA-PHELLANDRENE  | Root                      | --       | --     |           |          |
| 0 (+)-ALPHA-PHELLANDRENE  | Rhizome<br>Essent.<br>Oil | --       | --     |           |          |
| 0 (+)-AR-TURMERONE  | Rhizome                   | --       | --     |           |          |
| 0 (+)-SABINENE  | Root                      | --       | --     |           |          |
| 0 (+)-SABINENE  | Rhizome<br>Essent.<br>Oil | --       | --     |           |          |
| 0 1,5-BIS-(4-HYDROXY-3-METHOXY-PHENYL)-PENTA-TRANS-1-TRANS-4-DIEN-3-ONE | Rhizome                   | --       | 27     |           |          |
| 2 1,5-BIS-(4-HYDROXY-3-METHOXYPHENYL)-1,4-PENTADIEN-3-ONE               | Rhizome                   | --       | --     |           |          |
| 2 1,7-BIS-(4-HYDROXY-3-METHOXYPHENYL)-1,4,6-HEPTATRIEN-3-ONE            | Rhizome                   | --       | --     |           |          |
| 0 1,7-BIS-(4-HYDROXY-PHENYL)-HEPTA-1,4,6-TRIENE-3-ONE                   | Rhizome                   | --       | 3      |           |          |

| Chemical Plant Part |  | Low<br>PPM | High<br>PPM | StdDev | Reference | Citation   |
|---------------------|--|------------|-------------|--------|-----------|--|
| 2                   | 1,7-BIS-(4-HYDROXYPHENYL)-1-HEPTENE-3,5-DIONE  |            | Rhizome     | --     | --        |  |
| 67                  | 1,8-CINEOLE  |            | Rhizome     | 30     | 9575      | 0.3047864660484435   |
| 67                  | 1,8-CINEOLE  |            | Leaf        | --     | 330       | -0.4877780232076323  |
| 67                  | 1,8-CINEOLE  |            | Root        | --     | --        |  |
| 0                   | 1-(4-HYDROXY-3-METHOXY-PHENYL)-5-(4-HYDROXY-PHENYL)-PENTA-TRANS-1-TRANS-4-DIEN-3-ONE                 |            | Rhizome     | --     | 13        |  |
| 0                   | 1-(4-HYDROXY-3-METHOXY-PHENYL)-7-(3,4-DIHYDROXY-PHENYL)-HEPTA-1,6-DIENE-3,5-DIONE                    |            | Rhizome     | --     | 4         |  |
| 2                   | 1-HYDROXY-1,7-BIS-(4-HYDROXY-3-METHOXYPHENYL)-6-HEPTENE-3,5-DIONE                                    |            | Plant       | --     | --        |  |
| 0                   | 2,5-DIHYDROXY-BISABOLA-3,10-DIENE  |            | Rhizome     | --     | 3         |  |
| 0                   | 2-BORNANOL   |            | Plant       | --     | --        | J.S. Glasby Dict.Pls<br>Containing 2ndary<br>Metabolite. 1991. |
| 2                   | 2-HYDROXY-METHYL-ANTHRAQUINONE   |            | Rhizome     | --     | --        |  |
| 2                   | 4'-(3'-METHOXY-4''-HYDROXYPHENYL)-2''-OXO-3''-ENE BUTANYL-3-(3'-METHOXY-4'-HYDROXYPHENYL)-PROPENOATE |            | Rhizome     | --     | --        |  |
| 0                   | 4(S)-5(S)-EPOXY-GERMACRONE   |            | Rhizome     | --     | --        |  |
| 0                   | 4-HYDROXY-BISABOLA-2,10-DIEN-9-ONE   |            | Rhizome     | --     | 5.1       |  |
| 0                   | 4-HYDROXY-CINNAMOYL-(FERULOYL)-METHANE   |            | Rhizome     | --     | 180       |  |
| 0                   | 4-HYDROXY-CINNAMOYL-METHANE  |            | Rhizome     | --     | --        |  |
| 0                   | 4-HYDROXY-FERULOXYL-METHANE  |            | Rhizome     | --     | --        |  |
| 0                   | 5'-METHOXY-CURCUMIN  |            | Rhizome     | --     | 20        |  |
| 0                   | 5-HYDROXY-4-METHOXY-BISABOLA-2,10-DIEN-9-ONE   |            | Rhizome     | --     | 0.3       |  |
| 0                   | 5-HYDROXY-PROCURCUMENOL  |            | Rhizome     | --     | 0.6       |  |
| 0                   | ALPHA-ATLANTONE  |            | Root        | --     | --        |  |

| Chemical Plant Part |                    | Low<br>PPM | High<br>PPM                  | StdDev                   | Reference            | Citation   |
|---------------------|--------------------|------------|------------------------------|--------------------------|----------------------|--|
| 0                   | ALPHA-ATLANTONE    |            | Rhizome --                   | --                       |                      | Williamson, E. M. and Evans, F. J., Potter's New Cyclopaedia of Botanical Drugs and Preparations, Revised Ed., Saffron Walden, the C. W. Daniel Co., Ltd., Essex UK, 362 pp, 1988, reprint 1989. |
| 3                   | ALPHA-CURCUMENE    |            | Rhizome --                   | --                       |                      |  |
| 11                  | ALPHA-PHELLANDRENE |            | Leaf --                      | 2325                     | 1.3345170744070258   |  |
| 11                  | ALPHA-PHELLANDRENE |            | Rhizome --                   | 1945                     | 1                    |  |
| 28                  | ALPHA-PINENE       |            | Leaf 60                      | 1440                     | -0.1310531749310525  |  |
| 28                  | ALPHA-PINENE       |            | Tuber --                     | --                       |                      |  |
| 28                  | ALPHA-PINENE       |            | Rhizome --<br>Essent.<br>Oil | 5300                     | -0.9114147781537915  |  |
| 28                  | ALPHA-PINENE       |            | Rhizome --                   | --                       |                      |  |
| 28                  | ALPHA-PINENE       |            | Essential --<br>Oil          | 5300                     | -0.5134325695945586  |  |
| 13                  | ALPHA-TERPINENE    |            | Leaf --                      | 37                       | -0.2932431476626101  |  |
| 13                  | ALPHA-TERPINENE    |            | Rhizome --                   | 23                       | -1                   |  |
| 23                  | ALPHA-TERPINEOL    |            | Rhizome --                   | --                       |                      |  |
| 32                  | ALPHA-TOCOPHEROL   |            | Root 11                      | 18                       | -0.09053574604251821 |  |
| 0                   | ALPHA-TURMERONE    |            | Rhizome --                   | 3.7                      |                      |  |
| 13                  | AR-TURMERONE       |            | Rhizome 740                  | 5800                     |                      |  |
| 13                  | AR-TURMERONE       |            | Rhizome 183800               | 596870<br>Essent.<br>Oil |                      |  |
| 13                  | AR-TURMERONE       |            | Root --                      | --                       |                      |  |

| Chemical Plant Part |                        | Low<br>PPM | High<br>PPM               | StdDev | Reference            | Citation   |
|---------------------|------------------------|------------|---------------------------|--------|----------------------|--|
| 0                   | ARABINOSE              |            | Rhizome --                | 10000  |                      | Leung, A.Y., Encyclopedia of Common Natural Ingredients Used in Food, Drugs, and Cosmetics, John Wiley & Sons, New York, 1980. |
| 112                 | ASCORBIC-ACID          |            | Rhizome --                | 293    | -0.34465428565155654 | CRC Handbook of Medicinal Herbs and/or CRC Handbook of Proximate Analyses  |
| 112                 | ASCORBIC-ACID          |            | Plant --                  | --     |                      |  |
| 0                   | ASH                    |            | Plant 9920                | 32000  | -1.6080997471982341  |  |
| 0                   | ASH                    |            | Rhizome 9000              | 148000 | 0.8154551817141439   | CRC Handbook of Medicinal Herbs and/or CRC Handbook of Proximate Analyses  |
| 10                  | AZULENE                |            | Rhizome --                | --     |                      |  |
| 6                   | BETA-BISABOLENE        |            | Rhizome --                | --     |                      |  |
| 53                  | BETA-CAROTENE          |            | Plant 6                   | 18     | -0.6296931924279244  |  |
| 53                  | BETA-CAROTENE          |            | Rhizome --                | --     | -0.746733045887731   | CRC Handbook of Medicinal Herbs and/or CRC Handbook of Proximate Analyses  |
| 13                  | BETA-PINENE            |            | Essential Oil --          | 2700   | -0.670434055955317   |  |
| 13                  | BETA-PINENE            |            | Rhizome --                | --     |                      |  |
| 13                  | BETA-PINENE            |            | Leaf --                   | 215    | -0.11200647112758456 |  |
| 13                  | BETA-PINENE            |            | Rhizome --<br>Essent. Oil | 2700   | -0.04995838534443404 |  |
| 13                  | BETA-PINENE            |            | Tuber --                  | --     |                      |  |
| 5                   | BETA-SESQUIHELLANDRENE |            | Rhizome --                | --     |                      |  |

| Chemical Plant Part |                                      | Low<br>PPM | High<br>PPM    | StdDev | Reference | Citation  |
|---------------------|--------------------------------------|------------|----------------|--------|-----------|---|
| 47                  | BETA-SITOSTEROL                      |            | Rhizome        | --     | --        |   |
| 47                  | BETA-SITOSTEROL                      |            | Root           | --     | 510       | -0.26351706526294477 Spiller, G. A. 1996<br>(Spiller, G. A. Ed.<br>1996. CRC Handbook<br>of Lipids in Human<br>Nutrition. CRC Press.<br>Boca Raton, FL. 233<br>pp.) |
| 5                   | BETA-TURMERONE                       |            | Rhizome        | --     | --        |   |
| 1                   | BIS-(4-HYDROXY-CINNAMOYL)-METHANE    |            | Rhizome        | --     | --        |   |
| 1                   | BIS-(4-HYDROXY-CINNAMOYL)-METHANE    |            | Plant          | --     | --        |   |
| 0                   | BIS-(P-HYDROXY-CINNAMOYL)-METHANE    |            | Rhizome        | --     | 1360      |   |
| 0                   | BIS-(PARA-HYDROXY-CINNAMOYL)-METHANE |            | Rhizome        | --     | 1360      |   |
| 16                  | BIS-DEMETHOXCURCUMIN                 |            | Plant          | --     | --        |   |
| 16                  | BIS-DEMETHOXCURCUMIN                 |            | Root           | --     | 400       |   |
| 16                  | BIS-DEMETHOXCURCUMIN                 |            | Rhizome        | 6.6    | 16200     |   |
| 5                   | BIS-DESMETHOXCURCUMIN                |            | Rhizome        | 67     | 28000     | 1   |
| 0                   | BISABOLA-3,10-DIEN-2-ONE             |            | Rhizome        | --     | 13.5      |   |
| 0                   | BISABOLENE                           |            | Root           | --     | --        |   |
| 0                   | BISACUMOL                            |            | Rhizome        | --     | 2         |   |
| 0                   | BISACURONE                           |            | Rhizome        | --     | 9         |   |
| 35                  | BORNEOL                              |            | Rhizome        | --     | --        |   |
|                     |                                      |            | Essent.<br>Oil |        |           |   |
| 35                  | BORNEOL                              |            | Root           | --     | --        |   |
| 35                  | BORNEOL                              |            | Rhizome        | --     | --        |   |

| Chemical Plant Part |               | Low<br>PPM | High<br>PPM | StdDev | Reference            | Citation  |
|---------------------|---------------|------------|-------------|--------|----------------------|---|
| 4                   | BORON         | Root       | 1           | 6      | -0.667360795790836   | Betting on Boron,<br>Unpublished draft by J.<br>A. Duke on file at<br>USDA, draft and<br>papers relating to<br>boron percentages.<br>Includes Internat. Z.<br>Vit. Ern. Forschung<br>43:1973 (boron). |
| 102                 | CAFFEIC-ACID  | Rhizome    | --          | 5      |                      |   |
| 28                  | CALCIUM       | Rhizome    | 270         | 2898   | -0.8768568252409509  | CRC Handbook of<br>Medicinal Herbs<br>and/or CRC Handbook<br>of Proximate Analyses  |
| 28                  | CALCIUM       | Plant      | 226         | 730    | -1.3755257581090707  |   |
| 3                   | CALEBIN-A     | Rhizome    | --          | --     |                      |   |
| 2                   | CAMPESTEROL   | Rhizome    | --          | --     |                      |   |
| 2                   | CAMPESTEROL   | Root       | --          | 90     | -0.45238102172974776 | Spiller, G. A. 1996<br>(Spiller, G. A. Ed.<br>1996. CRC Handbook<br>of Lipids in Human<br>Nutrition. CRC Press.<br>Boca Raton, FL. 233<br>pp.)  |
| 9                   | CAMPHENENE    | Tuber      | --          | --     |                      |   |
| 9                   | CAMPHENENE    | Rhizome    | --          | --     |                      |   |
| 41                  | CAMPHOR       | Tuber      | --          | --     |                      |   |
| 41                  | CAMPHOR       | Rhizome    | --          | 600    | -1                   | Essent.<br>Oil  |
| 5                   | CAPRYLIC-ACID | Rhizome    | --          | --     |                      |   |
| 0                   | CAR-3-ENE     | Leaf       | 29          | 41     |                      |   |

| Chemical Plant Part |                 | Low<br>PPM    | High<br>PPM | StdDev                    | Reference            | Citation  |
|---------------------|-----------------|---------------|-------------|---------------------------|----------------------|---|
| 0                   | CARBOHYDRATES   |               |             |                           | Rhizome              | 79000 829000 0.7177691089649727   |
|                     |                 |               |             |                           |                      | CRC Handbook of Medicinal Herbs and/or CRC Handbook of Proximate Analyses |
| 31                  | CARYOPHYLLENE   | Tuber         | --          | --                        |                      |   |
| 31                  | CARYOPHYLLENE   | Rhizome       | --          | --                        |                      |   |
| 31                  | CARYOPHYLLENE   | Essential Oil | --          | 13400 -0.5168789270461833 |                      |   |
| 1                   | CHOLESTEROL     | Rhizome       | --          | --                        |                      |   |
| 24                  | CHROMIUM        | Plant         | 0.2         | 0.6                       | -0.8071397754932234  |   |
| 24                  | CHROMIUM        | Rhizome       | --          | 6                         | -1                   |   |
| 0                   | CINEOL          | Rhizome       | --          | --                        |                      |   |
| 0                   | CINEOL          | Rhizome       | --          | 29200                     |                      |   |
|                     |                 | Essent.       |             |                           |                      |   |
|                     |                 | Oil           |             |                           |                      |   |
| 0                   | CINEOL          | Tuber         | --          | --                        |                      |   |
| 0                   | CINEOLE         | Essential     | --          | 29200                     |                      |   |
|                     |                 | Oil           |             |                           |                      |   |
| 18                  | CINNAMIC-ACID   | Rhizome       | --          | --                        |                      |   |
| 2                   | COBALT          | Rhizome       | --          | 1                         | -1                   |   |
| 2                   | COBALT          | Plant         | 0.5         | 1.5                       | -0.42841157368319116 |   |
| 12                  | COPPER          | Rhizome       | 6           | 17                        | 1.4469860213540642   |   |
| 0                   | CUMINYL-ALCOHOL | Rhizome       | --          | --                        |                      |   |
| 0                   | CURCUMENE       | Tuber         | --          | --                        |                      |   |
| 0                   | CURCUMENE       | Rhizome       | --          | --                        |                      |   |
| 0                   | CURCUMENE       | Rhizome       | --          | 121700                    |                      |   |
|                     |                 | Essent.       |             |                           |                      |   |
|                     |                 | Oil           |             |                           |                      |   |

| Chemical Plant Part |               | Low<br>PPM | High<br>PPM                  | StdDev | Reference          | Citation |
|---------------------|---------------|------------|------------------------------|--------|--------------------|----------|
| 0                   | CURCUMENE     |            | Essential --<br>Oil          | 121700 |                    |          |
| 3                   | CURCUMENOL    |            | Rhizome --<br>Essent.<br>Oil | 21300  |                    |          |
| 3                   | CURCUMENOL    |            | Essential --<br>Oil          | 21300  |                    |          |
| 3                   | CURCUMENOL    |            | Rhizome --                   | 65     |                    |          |
| 0                   | CURCUMENONE   |            | Rhizome --                   | 26     |                    |          |
| 135                 | CURCUMIN      |            | Root --                      | 800    |                    |          |
| 135                 | CURCUMIN      |            | Plant --                     | --     |                    |          |
| 135                 | CURCUMIN      |            | Rhizome 9                    | 56000  | 1.3976645180230614 |          |
| 135                 | CURCUMIN      |            | Resin, --<br>Exudate,<br>Sap | 175000 |                    |          |
| 9                   | CURCUMINOIDS  |            | Root 30000                   | 80000  |                    |          |
| 3                   | CURCUMOL      |            | Rhizome --                   | --     |                    |          |
| 6                   | CURDIONE      |            | Rhizome --<br>Essent.<br>Oil | 11900  |                    |          |
| 6                   | CURDIONE      |            | Tuber --                     | --     |                    |          |
| 6                   | CURDIONE      |            | Essential --<br>Oil          | 11900  |                    |          |
| 6                   | CURDIONE      |            | Rhizome --                   | --     |                    |          |
| 0                   | CURLONE       |            | Rhizome --                   | 120    |                    |          |
| 0                   | CURZERENONE   |            | Tuber --                     | --     |                    |          |
| 0                   | CURZERENONE   |            | Rhizome --                   | --     |                    |          |
| 0                   | CURZERENONE-C |            | Essential --<br>Oil          | 20400  |                    |          |

| Chemical Plant Part |                       | Low<br>PPM | High<br>PPM                  | StdDev | Reference  | Citation   |
|---------------------|-----------------------|------------|------------------------------|--------|--|--|
| 0                   | CURZERENONE-C         |            | Rhizome --<br>Essent.<br>Oil | 20400  |  |  |
| 0                   | CYCLO-ISOPRENEMYRCENE |            | Rhizome 8500                 | 29750  | List, P.H. and<br>Horhammer, L.,<br>Hager's Handbuch der<br>Pharmazeutischen<br>Praxis, Vols. 2-6,<br>Springer-Verlag,<br>Berlin, 1969-1979. |  |
| 1                   | CYCLOCURCUMIN         |            | Rhizome 13.3                 | 8000   |  |  |
| 0                   | D-ALPHA-PHELLANDRENE  |            | Rhizome 30                   | 720    | List, P.H. and<br>Horhammer, L.,<br>Hager's Handbuch der<br>Pharmazeutischen<br>Praxis, Vols. 2-6,<br>Springer-Verlag,<br>Berlin, 1969-1979. |  |
| 0                   | D-CAMPHENE            |            | Rhizome --                   | 480    | -1   |  |
| 0                   | D-CAMPHOR             |            | Rhizome 30                   | 1500   | -0.29880116775229165   | List, P.H. and<br>Horhammer, L.,<br>Hager's Handbuch der<br>Pharmazeutischen<br>Praxis, Vols. 2-6,<br>Springer-Verlag,<br>Berlin, 1969-1979. |
| 0                   | D-SABINENE            |            | Rhizome 20                   | 432    |  | List, P.H. and<br>Horhammer, L.,<br>Hager's Handbuch der<br>Pharmazeutischen<br>Praxis, Vols. 2-6,<br>Springer-Verlag,<br>Berlin, 1969-1979. |
| 8                   | DEHYDROCURDIONE       |            | Rhizome --                   | 4.5    |  |  |

| Chemical Plant Part |                        | Low<br>PPM | High<br>PPM | StdDev | Reference | Citation   |
|---------------------|------------------------|------------|-------------|--------|-----------|--|
| 0                   | DEHYDROTURMERONE       |            | Rhizome     | --     | --        | List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.     |
| 20                  | DEMETHOXYCURCUMIN      |            | Rhizome     | 6.6    | 11100     |  |
| 20                  | DEMETHOXYCURCUMIN      |            | Plant       | --     | --        |  |
| 20                  | DEMETHOXYCURCUMIN      |            | Root        | --     | 500       |  |
| 0                   | DESMETHOXYCURCUMIN     |            | Rhizome     | 500    | 28000     | 1.3363062095621216   |
| 2                   | DI-P-COUMAROYL-METHANE |            | Rhizome     | --     | --        |  |
| 1                   | DICINNAMOYLMETHANE     |            | Rhizome     | --     | --        | List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.     |
| 0                   | DIDESMETHOXYCURCUMIN   |            | Rhizome     | --     | --        | Leung, A.Y., Encyclopedia of Common Natural Ingredients Used in Food, Drugs, and Cosmetics, John Wiley & Sons, New York, 1980. |
| 1                   | DIFERULOYL-METHANE     |            | Rhizome     | --     | --        |  |
| 0                   | DIHYDROCURCUMIN        |            | Rhizome     | --     | 57        |  |
| 0                   | EO                     |            | Plant       | 15500  | 80000     | 5.339729553841824  |
| 0                   | EO                     |            | Leaf        | --     | 4100      | -0.6539838935784101  |
| 0                   | EO                     |            | Rhizome     | 3000   | 72000     | 0.38278614749621226  |
| 2                   | EPI-PROCURCUMENOL      |            | Rhizome     | --     | 1.3       |  |
| 76                  | EUGENOL                |            | Tuber       | --     | --        |  |

| Chemical Plant Part |                                     | Low<br>PPM | High<br>PPM                  | StdDev | Reference           | Citation   |
|---------------------|-------------------------------------|------------|------------------------------|--------|---------------------|--|
| 76                  | EUGENOL                             |            | Rhizome --<br>Essent.<br>Oil | 2100   |                     |  |
| 76                  | EUGENOL                             |            | Essential --<br>Oil          | 2100   | -0.7050089035376114 |  |
| 0                   | FAT                                 | Plant      | 28830                        | 93000  | 0.6021091742130502  |  |
| 0                   | FAT                                 |            | Rhizome                      | 18000  | 153000              | 2.4259276123914604 CRC Handbook of Medicinal Herbs and/or CRC Handbook of Proximate Analyses   |
| 1                   | FERULOYL-4-HYDROXYCINNAMOYL-METHANE | Plant      | --                           | --     |                     |  |
| 1                   | FERULOYL-P-COUMAROYL-METHANE        |            | Rhizome                      | --     | --                  |  |
| 15                  | FIBER                               |            | Rhizome                      | 9000   | 84000               | -1.0343269648768965 CRC Handbook of Medicinal Herbs and/or CRC Handbook of Proximate Analyses  |
| 0                   | FIBER(CRUIDE)                       | Plant      | --                           | 63000  | -0.7596673986017957 |  |
| 0                   | FIBER(DIETARY)                      | Plant      | --                           | 370000 | 0.06486249593456934 |  |
| 0                   | FLAVONOIDS                          |            | Rhizome                      | 90     | 95                  |  |
| 8                   | FRUCTOSE                            |            | Rhizome                      | --     | 120000              | 1.413312598024455 Leung, A.Y., Encyclopedia of Common Natural Ingredients Used in Food, Drugs, and Cosmetics, John Wiley & Sons, New York, 1980. |
| 0                   | GAMMA-ATLANTONE                     | Root       | --                           | --     |                     |  |
| 0                   | GAMMA-ATLANTONE                     |            | Rhizome                      | --     | --                  | List, P.H. and Horhammer, L., Hager's Handbuch der Pharmazeutischen Praxis, Vols. 2-6, Springer-Verlag, Berlin, 1969-1979.                       |

| Chemical Plant Part |                            | Low PPM                      | High PPM | StdDev   | Reference   | Citation |
|---------------------|----------------------------|------------------------------|----------|----------|---|----------|
| 11                  | GAMMA-TERPINENE            | Leaf                         | --       | 90       | -0.19839281229128486  |          |
| 11                  | GAMMA-TERPINENE            | Rhizome                      | --       | 60       | -1  |          |
| 0                   | GERMACRENE                 | Rhizome                      | --       | --       | Bisset, N.G., ed. 1994.<br>Herbal Drugs and<br>Phytopharmaceuticals.<br>CRC Press. Boca<br>Raton, FL. 566 pp.                                       |          |
| 0                   | GERMACRON-(4S',5S)-EPOXIDE | Rhizome                      | --       | 0.7      |   |          |
| 0                   | GERMACRON-13-AL            | Rhizome                      | --       | 0.6      |   |          |
| 7                   | GERMACRONE                 | Rhizome                      | --       | --       |   |          |
| 7                   | GLUCOSE                    | Rhizome                      | --       | 280000 1 | Leung, A.Y.,<br>Encyclopedia of<br>Common Natural<br>Ingredients Used in<br>Food, Drugs, and<br>Cosmetics, John Wiley<br>& Sons, New York,<br>1980. |          |
| 18                  | GUAIACOL                   | Rhizome                      | --       | --       |   |          |
| 0                   | GUAIANE                    | Rhizome                      | --       | --       | Bisset, N.G., ed. 1994.<br>Herbal Drugs and<br>Phytopharmaceuticals.<br>CRC Press. Boca<br>Raton, FL. 566 pp.                                       |          |
| 6                   | IRON                       | Rhizome                      | 121      | 467      | 0.32660224579628255   |          |
| 6                   | IRON                       | Plant                        | 25       | 80       | -0.6440919715501999   |          |
| 7                   | ISOBORNEOL                 | Rhizome --<br>Essent.<br>Oil |          | 200      |   |          |
| 7                   | ISOBORNEOL                 | Tuber                        | --       | --       |   |          |
| 0                   | ISOPROCURCUMENOL           | Rhizome                      | --       | 1.6      |   |          |

| Chemical Plant Part |                      | Low<br>PPM | High<br>PPM                  | StdDev | Reference            | Citation   |
|---------------------|----------------------|------------|------------------------------|--------|----------------------|--|
| 0                   | L-ALPHA-CURCUMENE    |            | Rhizome --                   | 18000  |                      | Jeffery B. Harborne and H. Baxter, eds. 1983. Phytochemical Dictionary. A Handbook of Bioactive Compounds from Plants. Taylor & Frost, London. 791 pp. |
| 0                   | L-BETA-CURCUMENE     |            | Rhizome --                   | 18000  |                      |  |
| 60                  | LIMONENE             |            | Essential --<br>Oil          | 2300   | -0.7238268976657102  |  |
| 60                  | LIMONENE             |            | Leaf --                      | 125    | -0.31628413309781417 |  |
| 60                  | LIMONENE             |            | Rhizome --<br>Essent.<br>Oil | 2300   | -0.7761485185603905  |  |
| 60                  | LIMONENE             |            | Tuber --                     | --     |                      |  |
| 60                  | LIMONENE             |            | Rhizome --                   | 80     | -1.049460471807569   |  |
| 0                   | LINALOL              |            | Essential --<br>Oil          | 1600   | 1                    |  |
| 53                  | LINALOOL             |            | Rhizome --<br>Essent.<br>Oil | 1600   | -1                   |  |
| 53                  | LINALOOL             |            | Tuber --                     | --     |                      |  |
| 53                  | LINALOOL             |            | Rhizome --                   | --     |                      |  |
| 65                  | MAGNESIUM            |            | Plant 3038                   | 9800   | 1.779937751704662    |  |
| 14                  | MANGANESE            |            | Rhizome 33                   | 78     | -0.31727458910943884 |  |
| 14                  | MANGANESE            |            | Plant 2.5                    | 8.2    | -0.6361340105099139  |  |
| 0                   | MONODEMETHOXCURCUMIN |            | Rhizome --                   | --     |                      |  |
| 0                   | MONODEMETHOXCURCUMIN |            | Root --                      | --     |                      |  |

| Chemical Plant Part |                              | Low<br>PPM | High<br>PPM | StdDev | Reference            | Citation   |
|---------------------|------------------------------|------------|-------------|--------|----------------------|--|
| 0                   | MONODESMETHOXYCURCUMIN       |            | Rhizome --  | --     |                      | Leung, A.Y., Encyclopedia of Common Natural Ingredients Used in Food, Drugs, and Cosmetics, John Wiley & Sons, New York, 1980. |
| 39                  | NIACIN                       | Plant      | 22          | 70     | -0.09411242290768869 |  |
| 39                  | NIACIN                       | Rhizome    | 5           | 62     | -1.1295129485847604  | CRC Handbook of Medicinal Herbs and/or CRC Handbook of Proximate Analyses  |
| 3                   | NICKEL                       | Rhizome    | --          | 3.8    | -1                   |  |
| 4                   | O-COUMARIC-ACID              | Leaf       | --          | --     |                      |  |
| 25                  | P-COUMARIC-ACID              | Rhizome    | --          | 345    | 1                    |  |
| 1                   | P-COUMAROYL-FERULOYL-METHANE | Rhizome    | --          | --     |                      | Leung, A. Y. and Foster, S. 1995. Encyclopedia of Common Natural Ingredients 2nd Ed. John Wiley & Sons, New York. 649 pp.      |
| 16                  | P-CYMENE                     | Leaf       | --          | 310    | -0.1425664765796497  |  |
| 16                  | P-CYMENE                     | Rhizome    | 210         | 5184   | 1.9997542158504666   |  |
| 5                   | P-METHOXY-CINNAMIC-ACID      | Rhizome    | --          | 360    |                      |  |
| 1                   | P-TOLYL-METHYLCARBINOL       | Rhizome    | 500         | 1750   |                      |  |
| 1                   | P-TOLYMETHYLCARBINOL         | Rhizome    | 500         | 1750   |                      |  |
| 4                   | PHOSPHORUS                   | Plant      | 725         | 2340   | -0.6000258604656092  |  |
| 4                   | PHOSPHORUS                   | Rhizome    | 640         | 6307   | 1.0401873086070448   | CRC Handbook of Medicinal Herbs and/or CRC Handbook of Proximate Analyses  |

| Chemical Plant Part |                       | Low PPM | High PPM | StdDev | Reference            | Citation  |
|---------------------|-----------------------|---------|----------|--------|----------------------|---|
| 2                   | PHYSTOSTEROLS         | Root    | --       | 820    | -0.21102387892333058 | Spiller, G. A. 1996<br>(Spiller, G. A. Ed.<br>1996. CRC Handbook<br>of Lipids in Human<br>Nutrition. CRC Press.<br>Boca Raton, FL. 233<br>pp.)      |
| 14                  | POTASSIUM             | Rhizome | 4870     | 41271  | 3.143110666596612    | CRC Handbook of<br>Medicinal Herbs<br>and/or CRC Handbook<br>of Proximate Analyses  |
| 14                  | POTASSIUM             | Plant   | 5239     | 16900  | -0.3415285138089129  |   |
| 2                   | PROCURCUMENOL         | Rhizome | --       | 0.1    |                      |   |
| 0                   | PROTEIN               | Rhizome | 12000    | 306000 | 2.0009280065663138   |   |
| 0                   | PROTEIN               | Plant   | 31000    | 100000 | -0.6020445420166102  |   |
| 43                  | PROTOCATECHUIC-ACID   | Leaf    | --       | --     |                      |   |
| 176                 | QUERCETIN             | Rhizome | 90       | 95     | -1                   |   |
| 0                   | RESIN                 | Rhizome | --       | --     |                      | Leung, A.Y.,<br>Encyclopedia of<br>Common Natural<br>Ingredients Used in<br>Food, Drugs, and<br>Cosmetics, John Wiley<br>& Sons, New York,<br>1980. |
| 15                  | RIBOFLAVIN            | Plant   | --       | --     |                      |   |
| 15                  | RIBOFLAVIN            | Rhizome | --       | 12     | 1.6190517856385973   | CRC Handbook of<br>Medicinal Herbs<br>and/or CRC Handbook<br>of Proximate Analyses  |
| 7                   | SALICYLATES           | Root    | --       | 765    | 1.8939419576365641   |   |
| 0                   | SATURATED-FATTY-ACIDS | Rhizome | --       | --     |                      |   |
| 60                  | SELENIUM              | Plant   | 0.5      | 1.6    | -0.35611748372726487 |   |
| 4                   | SILICON               | Plant   | 6        | 20     | -0.425552572565658   |   |

| Chemical Plant Part  |  | Low<br>PPM                | High<br>PPM | StdDev | Reference            | Citation   |
|----------------------|--|---------------------------|-------------|--------|----------------------|--|
| 1 SODIUM             |  | Plant                     | 462         | 1490   | -0.22159718118474486 |  |
| 1 SODIUM             |  | Rhizome                   | 30          | 4290   | 4.312813192901911    | CRC Handbook of Medicinal Herbs and/or CRC Handbook of Proximate Analyses  |
| 1 SODIUM-CURCUMATE   |  | Plant                     | --          | --     |                      |  |
| 5 STARCH             |  | Rhizome                   | 300000      | 550000 | 0.7343043341593242   |  |
| 12 STIGMASTEROL      |  | Root                      | --          | 220    | 0.43921373955665255  | Spiller, G. A. 1996 (Spiller, G. A. Ed. 1996. CRC Handbook of Lipids in Human Nutrition. CRC Press. Boca Raton, FL. 233 pp.) |
| 12 STIGMASTEROL      |  | Rhizome                   | --          | --     |                      |  |
| 0 SUGARS             |  | Plant                     | 108500      | 400000 | 2.5556146442635606   |  |
| 6 SYRINGIC-ACID      |  | Leaf                      | --          | --     |                      |  |
| 0 TERPINENE          |  | Essential Oil             | --          | 27200  |                      |  |
| 0 TERPINENE          |  | Rhizome<br>Essent.<br>Oil | --          | 27200  |                      |  |
| 0 TERPINENE          |  | Tuber                     | --          | --     |                      |  |
| 0 TERPINENE          |  | Rhizome                   | --          | --     |                      |  |
| 18 TERPINEOL         |  | Essential Oil             | --          | 500    | -1                   |  |
| 18 TERPINEOL         |  | Rhizome<br>Essent.<br>Oil | --          | 500    |                      |  |
| 9 TERPINOLENE        |  | Leaf                      | 115         | 485    | 0.3857342005583795   |  |
| 4 TETRAHYDROCURCUMIN |  | Plant                     | --          | --     |                      |  |

| Chemical Plant Part |                         | Low<br>PPM | High<br>PPM                  | StdDev                     | Reference   | Citation  |  |
|---------------------|-------------------------|------------|------------------------------|----------------------------|---|---|--|
| 31                  | THIAMIN                 |            | Rhizome --                   | 8                          | 0.17349447958987207   | CRC Handbook of Medicinal Herbs and/or CRC Handbook of Proximate Analyses |  |
| 0                   | THIAMINE                |            | Plant --                     | --                         |   |   |  |
| 0                   | TOLYL-METHYLCARBINOL    |            | Rhizome --                   | --                         |   |   |  |
| 1                   | TRIETHYLCURCUMIN        |            | Plant --                     | --                         |   |   |  |
| 3                   | TURMERIN                |            | Rhizome --                   | 1000                       |   |   |  |
| 4                   | TURMERONE               |            | Root --                      | --                         |   |   |  |
| 4                   | TURMERONE               |            | Rhizome --<br>Essent.<br>Oil | 240700                     |   |   |  |
| 4                   | TURMERONE               |            | Rhizome 1800                 | 43200                      |   |   |  |
| 1                   | TURMERONOL-A            |            | Rhizome --                   | 282                        |   |   |  |
| 1                   | TURMERONOL-B            |            | Rhizome --                   | 193                        |   |   |  |
| 3                   | UKONAN-A                |            | Rhizome 33                   | 6600                       |   |   |  |
| 2                   | UKONAN-B                |            | Rhizome --                   | 47                         |   |   |  |
| 0                   | UKONAN-C                |            | Rhizome 52                   | 315                        |   |   |  |
| 0                   | UKONAN-D                |            | Rhizome --                   | 41                         |   |   |  |
| 0                   | UNSATURATED-FATTY-ACIDS |            | Rhizome --                   | --                         |   |   |  |
| 24                  | VANILLIC-ACID           |            | Leaf --                      | --                         |   |   |  |
| 0                   | WATER                   |            | Rhizome --                   | 133000 -1.1144884211539199 | CRC Handbook of Medicinal Herbs and/or CRC Handbook of Proximate Analyses |   |  |
| 0                   | WATER                   |            | Plant --                     | 690000 -0.346469410041001  |   |   |  |
| 0                   | ZEDOARONDIOL            |            | Rhizome --                   | 35                         |   |   |  |
| 77                  | ZINC                    |            | Rhizome --                   | 22                         | -0.3731629077654671   |   |  |

| Chemical Plant Part |             |  | Low<br>PPM | High<br>PPM | StdDev | Reference            | Citation       |
|---------------------|-------------|--|------------|-------------|--------|----------------------|----------------|
| 77                  | ZINC        |  | Plant      | 0.5         | 1.5    | -0.49949550935262865 |                |
| 6                   | ZINGIBERENE |  | Rhizome    | --          | 81400  |                      | Essent.<br>Oil |
| 6                   | ZINGIBERENE |  | Root       | --          | --     |                      |                |
| 6                   | ZINGIBERENE |  | Rhizome    | 750         | 18000  | 1                    |                |